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| APPLICATION NO.  | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.   | CONFIRMATION NO. |
|--|-------------|----------------------|-----------------------|------------------|
| 09/939,172   | 08/24/2001  | Trishul M. Chilimbi  | 50037.59US01          | 4159             |
| 27488  | 7590        | 01/04/2005           | EXAMINER              |                  |
| MICROSOFT CORPORATION<br>C/O MERCHANT & GOULD, L.L.C.<br>P.O. BOX 2903<br>MINNEAPOLIS, MN 55402-0903 |             |                      | NGUYEN BA, HOANG VU A |                  |
|  |             |                      | ART UNIT              | PAPER NUMBER     |
|  |             |                      | 2122                  |                  |

DATE MAILED: 01/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |   |   |  |
|------------------------------|---|---|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>09/939,172    | <b>Applicant(s)</b><br>CHILIMBI, TRISHUL M. |  |
|                              | <b>Examiner</b><br>Hoang-Vu A Nguyen-Ba | <b>Art Unit</b><br>2122                     |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 27 August 2004.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

1. This action is responsive to the amendment filed August 27, 2004.
2. Claims 1-22 remain pending.

### ***Response to Amendments***

3. Per Applicant's request, claims 7, 10 and 17-20 have been amended.
4. In view of Applicant's changes to Figures 6 and 8-11 to correct typographical errors, the objection to the drawings is hereby withdrawn.
5. In view of Applicant's amendments to the title to make it more descriptive and to the specification to correct minor typographical errors, the objection to the specification is hereby withdrawn.
6. In view of Applicant's amendments to claims 7 and 10 to correct minor informalities, the objection to these claims is withdrawn.
7. In view of Applicant's amendments to claim 10 to particularly point out and distinctly claim the invention and to render claim 10 directed to statutory subject matter, the rejections of claim 10 under 35 U.S.C. § 112, second paragraph and under 35 U.S.C. § 101 are withdrawn.
8. In view of Applicant's amendments to claims 17-20 to render these claims directed to statutory subject matter, the rejection of these claims under 35 U.S.C. § 101 is withdrawn.
9. In view of Applicant's filing of a terminal disclaimer, the rejections of claims 1 and 10 as being unpatentable over claims 1, 3, 9 and 13 of U.S. Patent Application No. 09/735,027 and U.S. Patent Application No. 09/939,162 under the judicially created doctrine of obviousness-type double patenting are withdrawn.

*Response to Arguments*

10. Applicant's arguments filed August 27, 2004 have been fully considered but they are not persuasive. The rejection of claims 1-22 under 35 U.S.C. § 102 (b) as being anticipated by *Larus*, "Whole Program Paths" ("Larus") is thus maintained.

Following is the examiner's response to Applicant's arguments.

**Claim 1:**

Applicant's essential argument:

When *Larus* is read in its entirety, *Larus* makes evident that the streamlining takes place through a particular compression algorithm (SEQUITUR) that compacts the program code by finding repeated code (code that occurs frequently). (See *Larus*, section 3.2) However, the above statements do not indicate or otherwise suggest the removal of less frequently occurring data access sequences from the trace file. (Emphasis added). In fact, applicant cannot find any such teaching in any portion of the *Larus* document. Accordingly, *Larus* cannot possibly anticipate claim 1.

Examiner's response:

In response to Applicant's argument that Applicant cannot find any teaching of removal of less frequently occurring data access sequences from the trace file, the Examiner directs Applicant's attention to page 261, right column, the two lines preceding the last one of the page, i.e., "At this point, non-terminals B and C are only used once and SEQUITUR eliminates them."

The Examiner maintains that claim 1 is anticipated by *Larus* and properly rejected.

### **Claims 2, 3, 5 and 6**

In response to Applicant's arguments, the Examiner maintains that the rejections of claims 2, 3, 5 and 6 are proper and maintained. See Office action.

### **Claims 4 and 7-9**

#### Applicant's argument:

*Larus* does not teach updating a stream flow graph that indicates how often each repetitively occurring data access pattern follows another repetitively occurring data access pattern (Emphasis added).

#### Examiner's response:

The Examiner notes that cited Figure 5 by Applicant shows the string "abbcabbcabbc." In this string, "bc" is shown repeatedly following "ab" three times, e.g., the number 3 above the circled C.

Claims 4 and 7-9 are thus anticipated by *Larus*.

### **Claim 7**

Regarding Applicant's assertion that *Larus* does not teach removing less frequently occurring data access sequences, see Examiner's response in conjunction with claim 1.

### **Claims 8 and 9**

See Office action, paragraph 12 regarding the rejection of these claims.

**Claim 10**

Since claim 10 is similar to claim 7, the same response is thus applied.

**Claims 11-16**

The Examiner maintains that features recited in these claims are anticipated by Larus. See Office action, paragraph 12.

**Claim 17**

The stream flow graph indicating frequency that a data access sequence follows another data access sequence is discussed in conjunction with claims 4 and 7-9 above.

**Claims 18-20**

The rejection of claim 17 is incorporated. Further, the features recited in these claims are anticipated by Larus. See Office action, paragraph 12.

**Claim 21**

The database feature recited in claim 21 is deemed inherent to the teachings of Larus because without a database or data structure storing the results of the profiling, the optimization process would not be possible.

**Claim 22**

The feature recited in claim 22 is anticipated by Larus. See Office action in paragraph 12.

In view of the foregoing discussion, the rejection of claims 1-22 under 35 U.S.C. § 102(b) as being anticipated by Larus is deemed proper and maintained.

***Claim Rejections - 35 USC § 102***

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

12. Claims 1-22 are rejected under 35 U.S.C. § 102(b) as being anticipated by Larus, “Whole Program Path,” May 1999.

**Claim 1**

Larus discloses at least:

*identifying repetitively occurring data access sequences in the trace file* (see at least Abstract, 2<sup>nd</sup> paragraph; Introduction, 2<sup>nd</sup> paragraph; Overview, 1<sup>st</sup> paragraph);  
*using the identified sequences to create a modified trace file by removing less frequently occurring data access sequences from the trace file* (see at least Introduction, 2<sup>nd</sup> paragraph, e.g., “... identifying heavily executed paths and streamlining them into ‘fast paths’;” Overview, 1<sup>st</sup> paragraph, e.g., “... transforms the trace into a more compact and usable form by finding its inherent regularity (i.e., repeated code)).

**Claim 2**

The rejection of base claim 1 is incorporated. Larus further discloses:

*constructing a grammar from the data accesses of the trace file (see at least Figure 2 and related discussion in the article);*

*building a candidate sequence using the grammar (see at least Figure 2 and related discussion in the article); and*

*if a cost of accessing data in the candidate sequence exceeds a threshold, marking the candidate sequence as a repetitively occurring data access sequence (see at least sections 4.1 and 4.2).*

### **Claim 3**

The rejection of base claim 1 and intervening claim 2 is incorporated. Larus further discloses *wherein computing the cost comprises multiplying a number of times the candidate sequence occurs in the grammar by a number of data accesses in the candidate sequence (see at least section 4.2, subpath's cost).*

### **Claim 4**

The rejection of base claim 1 is incorporated. Larus further discloses *using the identified data access sequences to update a stream flow graph that indicates how often each repetitively occurring data access pattern follows another repetitively occurring data access pattern (see at least Figure 2, WPP and related discussion in the article).*

### **Claim 5**

The rejection of base claim 1 is incorporated. Larus further discloses *wherein data accesses from the trace file are received as the computer program executes (see at least Figure 2 and related discussion in the specification).*

### **Claim 6**



The rejection of base claim 1 is incorporated. Larus further discloses *wherein the data access trace file is retrieved from a computer-readable medium* (see at least section Performance).

#### **Claim 7**

The rejection of base claim 1 is incorporated. Larus further discloses *wherein the modified trace file is further processed to compress data in it by steps, comprising:*  
*identifying other sequences of repetitively occurring data access sequences in the modified trace file* (see at least Figures 1, 2, 7 and related discussion in the article); and  
*using the other sequences to create another trace by removing less frequently occurring data access sequences from the modified trace file* (see at least Figures 1, 2, 7 and related discussion in the article).

#### **Claim 8**

The rejection of base claim 1 and intervening claim 7 is incorporated. Larus further discloses *wherein the other trace is used to pre-fetch data* (see at least section 3.2, “looking ahead” feature of SEQUITUR(1)).

#### **Claim 9**

The rejection of base claim 1 and intervening claim 7 is incorporated. Larus further discloses *wherein the other trace is used in placing data in a cache* (see at least section 3.3, last two paragraphs).

#### **Claim 10**

Larus discloses at least:

*receiving data access information from an executing program (see at least Figure 1, Path Profiling Tool; Figure 2; and related discussion in the article);*

*identifying when the data access information is part of a frequently occurring data access pattern (see at least Figures 1, 2 and related discussion in the article);*

*when the frequently occurring data access pattern follows another frequently occurring data access pattern, updating a data structure to reflect that the data access pattern follows the other data access pattern (see at least Figures 1, 2, 7 and related discussion in the article).*

#### **Claim 11**

The rejection of base claim 10 is incorporated. Larus further discloses *wherein the data access information is received on a computer upon which the executing program is executing (see at least section 5).*

#### **Claim 12**

The rejection of base claim 10 is incorporated. Larus further discloses *wherein the data access information is received on a computer other than a computer upon which the executing program is executing (see at least section 5).*

#### **Claim 13**

The rejection of base claim 10 is incorporated. Larus further discloses *wherein a grammar representing the data access information is used in identifying when the data access information is part of a frequently occurring data access pattern (see at least section 3).*

#### **Claim 14**

The rejection of base claim 10 is incorporated. Larus further discloses *wherein the data structure is a stream flow graph* (see at least Figure 2, WPP and related discussion in the article).

#### **Claim 15**

The rejection of base claim 10 and intervening claim 14 is incorporated. Larus further discloses *wherein the stream flow graph is used to pre-fetch data into memory* (see at least Figures 2, 7 and related discussion in the article).

#### **Claim 16**

The rejection of base claim 10 and intervening claims 14-15 is incorporated. Larus further discloses *wherein data is pre-fetched depending on the probability of the data being requested based on a current data access request* (see at least Figure 7 and related discussion in the article).

#### **Claim 17**

Larus discloses at least:

*a database structured to store data access information that includes data access sequences of the computer program* (see at least section 1, last paragraph and discussion related to WWP data structure in the article);

*a stream flow graph structured to store data that indicates a frequency that a data access sequence follows another data access sequence* (see at least Figure 2 and related discussion in the article); and

*a pre-fetcher configured to use the data access information and the stream flow graph to fetch data elements into memory for use by the executing computer program* (see at least section 3.2 and related discussion in the article).

**Claim 18**

The rejection of base claim 17 is incorporated. Larus further discloses *timing information that is used to determine when the data element should be retrieved* (see at least section 3.3).

**Claim 19**

The rejection of base claim 17 is incorporated. Larus further discloses *wherein during requests for data in one data access sequence, pre-fetching begins for data in another data access sequence that will follow* (see at least section 3.2).

**Claim 20**

The rejection of base claim 17 and intervening claim 19 is incorporated. Larus further discloses *wherein the other data access sequence follows when the one data access sequence dominates the other data access sequence* (see at least section 3.2).

**Claim 21**

Larus discloses at least:

*a database configured to store a stream flow graph* (see at least Figure 2, “Paths” and related discussion in the article);

*a database configured to store data access sequence information* (see at least Figure 2, “Acyclic Path Trace & “SEQUITUR Grammar”; and related discussion in the article); and

*a cache memory manager coupled to the stream flow graph database and the data access sequence database, wherein the cache memory manager is configured to arrange data elements of a repetitively accessed data stream in a cache using information from the two databases* (see at least Figure 2, “WPP” and related discussion in the article).

### **Claim 22**

The rejection of base claim 21 is incorporated. Larus further discloses *wherein the data elements of one repetitively accessed data stream are arranged in the cache to avoid a cache conflict* (see at least section 3.3).

### ***Conclusion***

13. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hoang-Vu "Antony" Nguyen-Ba whose telephone number is (571) 272-3701. The Examiner can normally be reached on Tuesday-Friday, 6:45 to 16:45.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Tuan Dam can be reached at (571) 272-3695. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



**ANTONY NGUYEN-BA**  
**PRIMARY EXAMINER**

Art Unit 2122

December 24, 2004